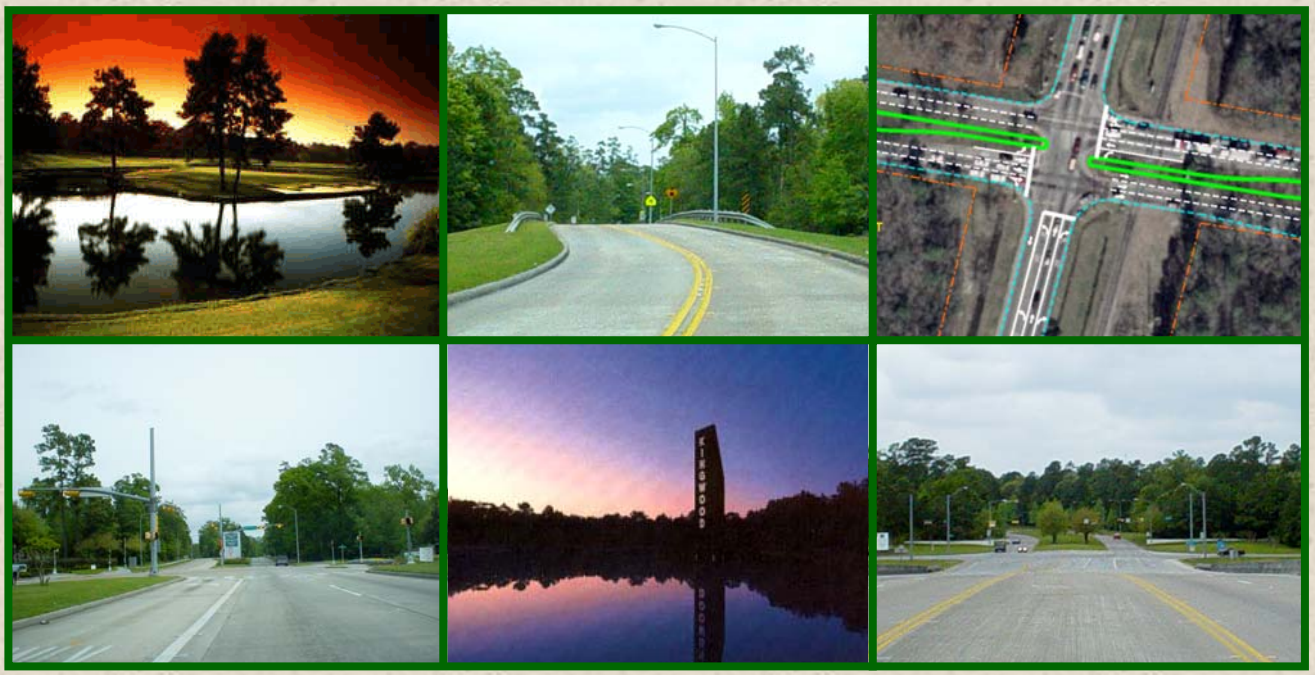
KINGWOOD TRANSPORTATION MOBILITY AREA STUDY

Draft Executive Summary



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INTRODUCTION

The Kingwood Transportation Mobility Area Study was initiated in the Summer of 2003 by the City of Houston in order to perform a comprehensive analysis of the existing roadway network and recommend modifications at intersections and along roadway segments within the Kingwood area that will result in substantial improvements for the mobility of residents residing in this large community. The analyses considered the traffic impacts caused by proposed new residential development in the Kingwood area; the future realignment of high school boundary lines; and the upcoming reconstruction of US 59; in addition to an evaluation of existing conditions. This Executive Summary describes all of the recommended improvements that will significantly improve the mobility of Kingwood area residents, and prioritizes these improvements by their costs and other factors.

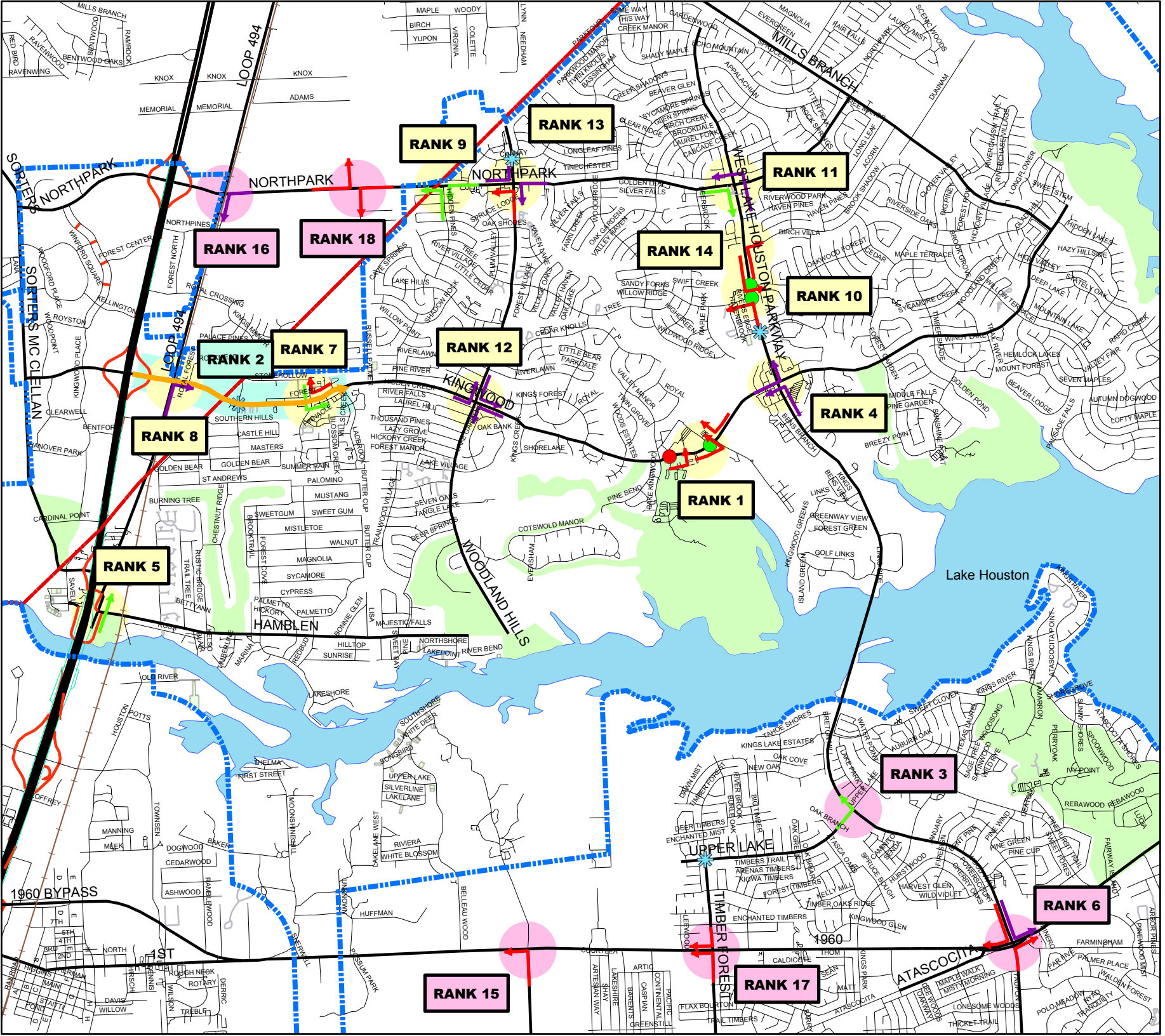
EXISTING CONDITIONS EVALUATION

The boundaries for the study area are generally defined as FM 1960 to the south; Lake Houston to the east; Montgomery/Harris County line and Northpark Drive to the north; and Sorters Road and US 59 to the west. The study area comprises a variety of land uses from commercial, retail, hospital, and office primarily on the western end of the study area, to mostly residential and parkland in the central and the eastern sectors. According to the U.S. Census, the population of the study area was approximately 78,500 in the Year 2000. The study area includes approximately 26,500 dwelling units, the majority of which (80%) are owner-occupied. Many neighborhoods have limited entry/exit points linking them to other neighborhoods or to major roadways. Limited access forces traffic onto key roadways with no opportunities to disperse onto parallel local streets. Undeveloped areas and open water and parkland also play a major role in defining the termination points of many local streets. Approximately 22% of the single family residential and 24% of the multifamily residential acreages are located within at least the 500-year floodplain, with a significant portion within the 100-year floodplain or even in the floodway.

The City of Houston authorized a significant traffic count collection effort for this study in the Fall of 2003. Summary statistics from the evaluation of the study intersections indicate that less than five percent of the intersections had an overall unacceptable level of service during one or more peak periods. However, at over 25% of the intersections, it is evident that during peak periods, the turn bay demand significantly exceeds the provision of the turn bay length, which to the driver is seen as back-ups into the through lanes at those particular intersection approaches. This traffic phenomenon is indicative of Kingwood resident complaints and exacerbates an overall traffic signal system that otherwise operates fairly well within the study area.

RECOMMENDED IMPROVEMENTS

In this section, brief descriptions of each mitigated improvement resulting from the thorough analysis performed on this project are provided. For the most part, improvements are isolated to critical intersections, but in some cases, coordination between several adjacent intersections is recommended. A summary of all of the described improvements is shown in the figure on the next page. Although relatively few intersections and roadway segments are recommended for improvement, these are critical improvements that affect a significant number of vehicles on a daily basis. It is important to point out that by improving critical pathways to allow for easier travel will also relieve other more minor intersections. These minor intersections are on routes that have in the recent past acted as “cut-through” routes for the congested arterials. So an improvement at one intersection may in fact improve levels of service at three or four other intersections.



Kingwood Transportation Mobility Area Study

Recommended Mitigation Measures

Roadway Improvements

- Add 3rd Through Lane
- Add Turn Lane
- Add Storage to Turn Lane
- Restripe Approach

Intersection Improvements

- Close Median
- Signalize Intersection
- Pedestrian Improvements

- Inside City of Houston Jurisdiction
- Outside City of Houston Jurisdiction
- City of Houston Boundary
- County Boundary

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Loop 494 and Northpark Drive

The westbound left turn bay should be extended to accommodate a greater storage of turning vehicles. This improvement is particularly beneficial during the morning peak period when drivers who wish to turn left are prohibited from doing so due to extensive through traffic queues. Therefore, the protected westbound turn signal is not being fully utilized and wasted green time occurs. In addition to this roadway improvement, this intersection also needs to have fully marked pedestrian crosswalk features across the west leg and south leg. The west leg is most critical in this regard, due to the presence of large groups of day laborers that congregate in the southwest quadrant and occasionally walk to the northwest corner to utilize the convenience store at this location.

Northpark Drive and Hidden Pines Drive

Geometric improvements rather than signalization would be the best solution to solve the recurring morning peak hour congestion associated with this intersection. The existing wide median can be used to create new curb lines that would form a de facto acceleration/merge lane for the northbound left turn movement while causing no delays for the westbound through movement. In the mitigated solution, the westbound left turn movement would have to stop and yield the right-of-way to the northbound left movement, which is opposite of what occurs today. This should not be an issue because there is plenty of storage for this westbound movement and the number of cars making this move is very small during the morning peak period, when the northbound left turns are the heaviest. The location of the acceleration/merge lane takes advantage of the large clear space in the existing median and does not require the removal of a single tree. In addition, with the creation of this new intersection geometry, both the northbound left turning drivers and the westbound through drivers have much greater visibility of each other, making it safer for both movements.

Northpark Drive and Russell Palmer Road

This is currently a signalized T-intersection. However, it presently has no westbound or eastbound left turn lanes and all left turn movements are permissive only. This results in congestion and confusion within the small median opening with westbound left turns competing against the eastbound U-turns and northbound left turns simultaneously. Typically, the congestion queues into the through lanes on Northpark Drive. The recommended improvement to this intersection consists of creating left turn storage lanes for the eastbound U-turns and the westbound left turns plus clearly marking the travel paths within the median. In addition, the eastbound and westbound turn lanes need to have protected signal indications that would allow the drivers to quickly and efficiently make their maneuvers without having to yield to other turning movements within the median. By having these protected signal phases, there should never be any driver "caught" in the median at any time. It should be noted that the existing ditch in the median of Northpark Drive will require that both of the new turn lanes have short retaining walls constructed as part of this project. The length of the turn lanes was kept to a minimum in order to lower the retaining wall construction cost as much as possible.

Northpark Drive and Woodland Hills Drive

In both the eastbound and westbound directions, the existing turn lanes are recommended for lengthening in order to reduce queuing into the through lanes, plus allowing left turning vehicles better access to their lanes. The northbound approach is significantly enhanced with the addition of dual left turn lanes which then allows for the signal timing at this intersection to be better optimized. The creation of the dual left turn lanes will result in the closure of the existing southbound left turn lane serving the Jack-in-the-Box restaurant in the southeast quadrant of the intersection. This restaurant, however, has other ingress points from Northpark Drive, and the median opening along Woodland Hills will still remain unchanged for exiting Jack-in-the-Box patrons. Additional pedestrian features also need to be added to this intersection

to make it fully compliant with pedestrian needs, especially given its proximity to the Kingwood Ninth Grade Campus (which will soon become the new Kingwood Park High School).

Northpark Drive and West Lake Houston Parkway

This intersection has a heavy directional flow in the mornings with northbound traffic turning left to proceed west on Northpark Drive, and in the afternoons with eastbound right turns proceeding south on West Lake Houston Parkway. It is recommended that the northbound left turn lane be extended and that the eastbound outer curb lane along Northpark Drive be converted to a right turn only lane. It was also observed during several field visits that the median opening just south of this intersection was frequently congested. This median opening provides full access for drivers in any direction and is used by Sonic Drive-In and Kroger customers. To reduce some of the median conflicts, it is recommended that this median opening be narrowed to 12 feet and be restricted to westbound movements only.

West Lake Houston Parkway and Brook Shadow Drive

This intersection is presently an unsignalized T-intersection. Brook Shadow Drive serves as a local collector roadway for the residential area east of West Lake Houston Parkway. It is also the access roadway to Greentree Elementary School located east of the study intersection. This elementary school has an impact upon the morning peak hour which coincides with the school start time. Traffic queues from the school often extend onto northbound West Lake Houston Parkway. The recommended improvement converts the existing northbound outer curb lane into a right turn only lane while shifting the two northbound through lanes to the west by approximately 12 feet. Given the shifting physical alignment in the current roadway profile, this modification "straightens out" the northbound through lanes, leaving the remaining easternmost pavement for the creation of the dedicated right turn lane. In addition, new crosswalks are needed along the east and south legs of this intersection.

West Lake Houston Parkway at Oakwood Forest Drive and Sandy Forks Drive

The combined intersections of Oakwood Forest Drive and Sandy Forks Drive were studied as a group because both form T-intersections with West Lake Houston Parkway and both are significantly impacted by traffic movements associated with Creekwood Middle School located along the west side of West Lake Houston Parkway. The current layout of the unsignalized intersections operates poorly because of the wide median openings and the lack of control of vehicular movements within these median openings. The best corrective measure is to signalize and operate both signals together using a single controller. A new northbound left turn lane at Sandy Forks Drive and a new southbound left turn lane at Oakwood Forest Drive are also recommended. The existing one-way driveways for Creekwood Middle School along West Lake Houston Parkway would remain but would be converted to right-in/right-out only and thus not need any traffic signal control. Additional crosswalks and other pedestrian features are also recommended at both intersections. This study also recommends that Humble ISD implement a new roadway connection from the east side of the middle school to the parking lot located on the south side of the school. This one-way roadway would then provide drivers with an option of accessing Sandy Forks Drive without driving on the more congested West Lake Houston Parkway. The second modification recommended to Humble ISD is the conversion of the two driveways along Sandy Forks Drive into Entrance Only and Exit Only driveways, which will assist in improving general circulation within the parking lot area.

Kingwood Drive and Loop 494

The improvement at this intersection consists of an extension of the existing northbound right turn lane in order to accommodate the heavy afternoon traffic flow. Once the US 59 construction period is over, some of this right-turning traffic may use the improved capacity of the US 59 northbound frontage road rather than Loop 494 and that may ease the overall impact to this intersection.

Kingwood Drive and Green Oak Drive

The recommended improvements at this intersection include the addition of a westbound right turn lane and reconfiguring the southbound approach lane movements to allow for dual left turns. In addition, pedestrian facilities are needed across the west leg to connect to existing sidewalks.

Kingwood Drive Through Lanes

Kingwood Drive is recommended to be expanded from four lanes to six lanes between US 59 Northbound Frontage Road and Ladbrook Drive. The City of Houston has recently requested that TxDOT reconstruct the western portion of Kingwood Drive between US 59 and Loop 494, as part of the overall US 59 project. At the east terminus, Kingwood Drive already has a right-turn only lane at Ladbrook Drive which is an ideal location to end the eastbound lane. Three other criteria make Ladbrook Drive the best location to end the third lane. First, east of Ladbrook, Kingwood Drive has to cross the first of several pedestrian trail overpasses. Widening the overpasses in both the east and west directions would be a substantial cost. Second, east of Ladbrook, there are significantly more trees in the median as compared to west of Ladbrook. The City will stay consistent with the current Tree and Shrub Ordinance on this widening project (as well as on all of the other recommended projects in this report), so that most median trees are protected. Finally, the area between US 59 and Ladbrook can be considered to be mostly commercial land uses as opposed to the mostly residential areas east of Ladbrook. These commercial land uses cause significant turns in and out of their driveways, which would mean that a third lane would certainly benefit the through traffic in this area. For the entire length of this widening, it is recommended that the 24 additional feet of pavement be taken from the wide median. This avoids relocating the street light poles, utilities, sidewalks and other appurtenances. This also avoids the need to acquire any additional right-of-way to achieve this improvement.

Kingwood Drive and Woodland Hills Drive

The recommendation at this intersection is to extend three of the four left turn bays (all approaches except northbound) to accommodate the existing left turn volume in these three directions. In the westbound direction, an existing median opening can be closed off to help make the left turn bay extension function better. This median opening is not needed at this location since it only serves a rare U-turning vehicle that can be made at an adjacent location.

Kingwood High School Transportation Improvements

Kingwood High School presently has three driveways intersecting with Kingwood Drive. The West Driveway is an exit only driveway. The Central Driveway is both an entrance and an exit but is arranged in such a way that most of the entering traffic is to the left of the exiting traffic. Two median openings exist along Kingwood Drive for both of these driveways that allow full access for any movement. Across from the West Driveway on the south side of Kingwood Drive is an off-set driveway to an apartment complex. The high school driveways, particularly the Central Driveway, operate poorly during high school ingress and egress time periods. Given the operational deficiencies of these two driveways, combined with the larger volume of traffic using the East Driveway, it was determined that it is best to fully close the median opening across from the West Driveway, and convert the Central Driveway into a right-in only and the West Driveway into a right-out only configuration. The Central Driveway would have a reconstructed median opening that would allow eastbound left turns or U-turns only. The apartment complex across the street from the high school will have the ability of performing U-turns at this reconstructed Central Driveway.

The East Driveway is currently the main driveway to and from the high school and is expected to remain the focal point once the redistricting of school boundary lines occurs in 2006. The recommended signalization and widening of this intersection will result in a higher capacity throughput of all

movements at this driveway. The creation of an exclusive westbound right turn lane can be made using the existing outside curb through lane, while the two through lanes are shifted slightly into the median in this area. An eastbound left turn lane can also be created by taking land from the wide median. These median excursions shall minimally impact the median trees since most of the trees are located much further than the required two foot offset away from the curb line. Although pedestrian traffic is not expected to be significant, crosswalks and other pedestrian features should be implemented with this improvement. In addition to the roadway improvements, it is strongly recommended that Humble ISD implement improvements within the existing Kingwood High School student parking lot that would greatly assist in the internal traffic circulation. First, a sidewalk (minimum of four feet wide) needs to be constructed along the East Driveway in order to connect Kingwood Drive with the existing sidewalk near the Tennis Courts. Second, a clearly designated counterclockwise automobile circulation pattern needs to be instituted following the outside boundaries of the existing student parking lot. To further enforce this pathway, a continuous eight-inch high, eight-inch wide curb should be constructed along the east, north and south edges of the parking lot to clearly produce a path to be traveled. Access to the parking lot aisles shall be obtained only from the west side of the parking lot. The parking aisles and parking spaces should be restriped because of the changes to the outside boundaries of the parking lot in order to maximize the spaces within the remaining open area. All exiting traffic flow will be directed to enter the exiting pathway located near the existing Central Driveway and will then be able to queue up in orderly fashion at the East Driveway signalized intersection with Kingwood Drive.

Kingwood Drive and West Lake Houston Parkway

This major intersection is surrounded by retail developments in all four quadrants. This intersection operates adequately except that the eastbound left turn and northbound left turn lanes are not quite long enough to support the turning volume demand during peak periods. The extension of the eastbound turn lane involves closing an existing median opening. Access to the HEB grocery store and other retail parcels located in the northwest quadrant is adequate using other driveways and should not impact operations at this retail center. The northbound left turn extension will cut into a wide median and will require the removal and replanting of eight young street corridor trees that have been recently planted near the existing median edge.

Loop 494 and Hamblen Road

Geometric improvements recommended at this location involve striping out the existing outside northbound through lane to create a dedicated receiving lane for westbound right turning Hamblen Road drivers. These drivers would then have room to merge left if they wish to turn onto Sorters-McClellan Road.

West Lake Houston Parkway and Upper Lake Drive

The improvement at this intersection is simply to convert one of the through lanes into a left turn only lane in the eastbound direction so that more vehicles can make this movement during peak periods using the same amount of green time. The east leg of the intersection narrows down to a single eastbound lane just past this intersection so reducing the number of through lanes will not impact the traffic flow. The east/west legs would operate on a split phase cycle with the majority of the side street green time provided to the eastbound approach.

FM 1960 and Woodland Hills Drive

This signalized intersection is a four-legged intersection but since the north leg is a private gated driveway carrying very little traffic volume, this intersection typically acts as a T-intersection. FM 1960 carries a tremendous amount of volume eastbound and westbound through this intersection and thus needs to have as much green time as possible. To assist in this, the recommended improvement adds an

additional northbound approach lane and restripes both lanes such that an exclusive left and a shared left/through/right lane are available to maximize the side street green time when provided. The southbound approach, when detected, would have its own short phase so no conflict with dual northbound left turns would occur.

FM 1960 and Timber Forest Drive

This intersection contains significant turning and through volumes in each direction, making it challenging to reallocate limited green times. The best recommendation is to implement the addition of a second northbound left turn lane which would help reduce the green time need for this approach. The other mitigation element is the creation of a channelized southbound right turn lane to accommodate the very heavy right turn movement, particularly in the mornings. This will require that the abandoned gas station located in the northwest corner be purchased for approximately $165,000 (appraised value) in order to create this dedicated channelized right turn lane. This appears to be the least expensive and most beneficial solution for assisting this southbound right turn volume, since it avoids a large cluster of utilities.

FM 1960 and West Lake Houston Parkway

Northbound and southbound approach improvements are recommended that should improve the operations of this intersection. On the northbound approach, a short exclusive right turn lane can be created just past an existing power pole. On the southbound approach, an exclusive right turn lane can be created and the left turn lane lengthened by narrowing the existing median by approximately eleven feet. The shift of the through lanes actually benefits from this improvement by lining up more close by with the south leg receiving lanes versus current conditions. The median is impacted with the loss of five trees. Additionally, it should be noted that underground petroleum pipelines are located underneath the north leg of this intersection and that a vault access exists in the current median. While the pipelines should not be impacted by this construction, the vault access may need to be adjusted depending on the final design of this improvement.

Finally, it needs to be pointed out that with the improvements recommended for FM 1960 as described in this report, a signal timing coordination plan should be implemented for all traffic signals on FM 1960 from the FM 1960 bridge (over Lake Houston) to the Humble city limits (near Moonshine Hill Road), after the above improvements are constructed. These signals are all maintained by Harris County so coordination with Harris County and the Texas Department of Transportation is necessary. The coordination of all traffic signals in this corridor will provide improved travel times and less delays than currently exist. However, even with such signal coordination, the long term improvement need in this corridor is to widen FM 1960 to six lanes between the bridge and its current six-lane cross-section in Humble. This would be a major project and would require the conversion of a significant length of rural cross-section with open swale ditches to a closed storm drain urban cross-section with curbs. The City of Houston and Harris County need to work together with the Texas Department of Transportation and the Houston-Galveston Area Council to make this long-term transportation project a reality.

PEDESTRIAN IMPROVEMENTS

During the field traffic counts conducted in the Fall of 2003, the number of pedestrians crossing at 45 study intersections were recorded and analyzed. Field analysis revealed that generally the Kingwood area has a good pedestrian network in most areas where pedestrians were noted. However, in some locations, pedestrian features were not fully compliant with Americans with Disability Act (ADA) standards. A total of 18 intersections have some degree of pedestrian improvements that are needed in order to make the intersection fully acceptable to all pedestrians. Since 14 of these intersections also include geometric intersection improvements, they have been incorporated in the previous section and are not repeated here.

The remaining four intersections have strictly pedestrian improvement recommendations. These intersections were not included in the cost/benefit analysis section due to the difficulty in calculating a dollar benefit. A brief description of these intersections follows.

Intersection	Pedestrian Mitigation Measure	Estimated Cost
Woodland Hills Drive and Chanay Lane	Install wheelchair ramps and crosswalk markings plus add new curb	$4,200
West Lake Houston Parkway and Rustic Woods Drive	Install wheelchair ramps, crosswalk markings, and pedestrian signals	$14,000
Kingwood Drive and Chestnut Ridge Road	Install wheelchair ramps, crosswalk markings, stop bar markings, and pedestrian signals	$14,300
Upper Lake Drive and Timber Forest Drive	Install wheelchair ramps and repair curb	$4,300
	TOTAL	**$36,800**

CONSISTENCY OF MITIGATION IMPROVEMENTS WITH PUBLIC COMMENTS

An important starting point to the Kingwood Mobility project was to engage the citizens of the study area early into the process and query them regarding what they considered as the biggest transportation mobility problems within their community. The first public meeting was held in August 2003 and resulted in substantial follow-up written survey responses which elicited very specific improvements desired by the residents. Over 100 separate improvements were recommended for the study area. These citizen comments were reviewed several times in the course of the consultant investigation of mobility issues, and the mitigation improvements recommended in this report have good concurrence with the mobility recommendations made by the citizens. The proposed mitigation elements recommended in this report will address a substantial percentage of the written citizen comments.

Other citizen comments, particularly those requesting extending Woodland Hills, Mills Branch, Kingwood Drive, or Hamblen Road, or those recommending significant additional through lanes were examined, but were determined to be too cost prohibitive versus the improved mobility that would be provided. The study area north of the San Jacinto River and west of Lake Houston (where most of the population resides) will continue to orient its long distance trips north-south instead of east-west due to its particular geographical position in the Houston metroplex. With the pending capacity improvements to US 59, the north-south mobility bottleneck specific to this highway will be removed and thus, the focus of the immediate needs -- and therefore this study – is to improve the internal east-west circulation to and from US 59.

Long term roadway improvements will become more critical once the southern portion of Montgomery County begins to substantially develop. Extension of Kingwood Drive and Northpark Drive to the west, and Ford Road across US 59 should be analyzed at that time. Similarly, extensions of Woodland Hills Drive and West Lake Houston Parkway to the north should also be considered at that time. Several citizens also recommended the connection of Hamblen Road and Woodland Hills Drive near the San Jacinto River. Logically, it makes sense to complete the collector roadway grid in this portion of the study area and would probably relieve some cut through traffic currently using Forest Cove Drive and Walnut Lane. However, the eastern portion of Hamblen Road east of Lisa Lane, and the southern portion of Woodland Hills Drive south of Cotswold Boulevard are considered to be in the floodway of the San Jacinto River. In order to properly meet design standards, both Hamblen Road and Woodland Hills Drive would have to be elevated from their current vertical profile in order to be made passable during heavy rainstorms. Such elevation would be extremely costly and actually would not benefit very many drivers, particularly after US 59 is improved (making it much faster to gain access to Kingwood Drive), and after

Kingwood Drive is widened (eliminating the need to "cut through" the Forest Cove subdivision). Therefore, this study recommends that the City not construct this connection at this time.

PRIORITIZATION OF IMPROVEMENTS

Following the establishment of the recommended mitigation measures, the prioritization of these improvements was the next step. This included compiling data about each intersection in several different categories, including traffic volumes, delay times, crash rates, turn lane queues, construction costs, and citizen requests. A spreadsheet was developed that performs all of the necessary calculations for the prioritization of those mitigation measures. This spreadsheet allows for weighting factors to be assigned to each measure of effectiveness as desired. Using this prioritization methodology, all of the recommended Kingwood mitigation measures were input into the spreadsheet and the resulting cost/benefit analysis was then computed. Those mitigation measures with the highest rankings, it can be concluded, would offer the most mobility benefit to the Kingwood area citizens given the cost of their improvements. The intersection average scores were ranked and those rankings are presented in the table on the next page. Those intersections highlighted in yellow are within the City of Houston jurisdictional boundary, although some of these intersections may be maintained by the Texas Department of Transportation (TxDOT). All of the other intersections are either within the Montgomery County or Harris County jurisdictions. One mitigation measure not included in the table is the corridor retiming of traffic signals along Kingwood Drive, Northpark Drive, and West Lake Houston Parkway. Such systemwide retiming is recommended following the implementation of all (or most) of the listed mitigated elements.

The total cost of the recommended improvements is $4,570,600 (including the $36,800 for pedestrian only improvements at four intersections). The City of Houston's responsibility for mitigating these intersections and roadway segments sums up to $3,343,600 or approximately 73% of the total. These dollar values include engineering estimates of the construction, design, and contingency costs. Actual survey and design at a later date will establish more detailed costs for each improvement.

CONCLUSION

In conclusion, it is recommended that the City of Houston, working together with the Texas Department of Transportation, Harris County, Montgomery County, and Humble ISD, proceed forward with the recommended improvements described in this report. Although minor tweaks can still be made at the design and construction stage to account for unknown elements such as underground utilities, these improvements as described conceptually in this document will significantly improve the mobility of residents within the Kingwood study area. The prioritized order of the mitigation elements is also important for the City to follow since it will result in quicker positive results readily observed by the traveling public. Since the Texas Department of Transportation is responsible for several of the recommended mitigation measures, coordination with this agency to make these improvements is strongly encouraged in order to truly see a regional improvement in mobility throughout the area.

Mitigation Measures Prioritized by Intersection

Rank	Intersection	Mitigation Measure	Estimated Cost
1	Kingwood Drive & Kingwood High School Driveways	Signalize and geometric improvements	$361,800
2	Kingwood Drive - US 59 NB Frontage Road to Ladbrook Drive	Widen from four lanes to six lanes	$2,468,100*
3	West Lake Houston Parkway & Upper Lake Drive	Restripe for dual EB left turn lanes	$2,700
4	Kingwood Drive & West Lake Houston Parkway	Extend NB left turn storage by 150' and extend EB left turn storage by 75’	$68,500
5	Loop 494 & Hamblen Road	Create receiving lane for WB right turn	$9,100**
6	FM 1960 & West Lake Houston Parkway	Add NB and SB right turn lane	$82,900
7	Kingwood Drive & Green Oak Drive	Add WB right turn lane and restripe for optional dual SB left turn	$43,000
8	Kingwood Drive & Loop 494	Extend NB right turn storage by 100'	$23,100**
9	Northpark Drive & Hidden Pines Drive	Construct NB left turn acceleration lane	$79,300
10	West Lake Houston Parkway & Oakwood Forest Drive and Sandy Forks Drive	Signalize and geometric improvements	$475,000
11	Northpark Drive & West Lake Houston Parkway	Extend NB left turn storage by 75'	$35,800
12	Kingwood Drive & Woodland Hills Drive	Extend EB, SB, and WB left turn storage by 75'	$40,500
13	Northpark Drive & Woodland Hills Drive	Add second NB left turn lane; extend NB and WB left turn storage by 100’; and extend EB left turn storage by 150’	$120,800
14	West Lake Houston Parkway & Brook Shadow Drive	Add NB right turn lane	$66,900
15	FM 1960 & Woodland Hills Drive	Add dedicated NB left turn lane	$20,100
16	Northpark Drive & Loop 494	Extend WB left turn storage by 75'	$36,500
17	FM 1960 & Timber Forest Drive	Add second NB left turn lane and add SB right turn lane	$521,200
18	Northpark Drive & Russell Palmer Road	Add dedicated WB left turn lane and dedicated EB U-turn lane	$78,500
		TOTAL	**$4,533,800**

* Includes approximately $447,800 that can be incorporated as part of TxDOT’s US 59 reconstruction project
** TxDOT intersection improvement